

A comparison of two onchidiid species (Mollusca, Pulmonata)

Isabel T. Hyman

School of Biological Sciences, Zoology (A08), University of Sydney, Sydney, NSW 2006

Abstract

Two externally similar species of Onchidiidae (Superfamily Onchidioidea), *Onchidium verruculatum* and *Onchidina australis*, occur together at Careel Bay in Sydney, NSW. These species were identified in a study of both external and internal morphology. The alimentary system and reproductive structures were examined and are illustrated. The most obvious external character separating the two species is the position of the pneumostome, which is located posteriorly in the midline in *Onchidium verruculatum* and to the right of the midline in *Onchidina australis*. In addition, differences in shape and colour distinguish the two species, as does presence or absence of accessory eyes. Important anatomical differences are the length of the penis and the presence or absence of an accessory penial gland, the number of lobes of the ovotestis and the presence or absence of a crop.

Key words: Onchidiidae, Australia

Introduction

The Onchidioidea is a group of marine pulmonate molluscs containing one family, Onchidiidae. For a recent summary of the group in Australia see Stanisc (1998). This family has been considered taxonomically difficult because few of the external characters can be used to distinguish between genera and species, especially if only preserved material is available.

Members of this group are slug-like and are usually found between tide marks, in holes and burrows or under logs and rocks. Onchidiids are found in tropical and continental areas, usually in mangrove swamps or estuarine shores, and less commonly on rocky shores. The highest diversity is in Southeast Asia (Britton, 1984). Five species have previously been recorded from around Sydney (Bretnall, 1919; Dakin, 1947): *Onchidium verruculatum* Cuvier 1830, *Onchidium damelli* Semper 1882, *Onchidella patelloides* Quoy and Gaimard 1832, *Onchidina australis* Semper 1882 and *Platevindex chameleon* Brazier 1886. The onchidiids of New South Wales or, indeed, Australia have not been reviewed since Bretnall's (1919) study. Smith and Kershaw (1979) provide a key to the South East Australian species. The reader is referred to Bretnall (1919) for details of the available names and original taxonomic references.

Two onchidiid species that are very similar externally can be found in a mangrove swamp in Careel Bay, Pittwater. They were identified by a study of internal and external characteristics. This paper records the differences found between the two species and identifies the external characters that can be used to identify these species.

Materials and Methods

Five specimens of each species were collected at Careel Bay, Pittwater. Voucher specimens were collected several months later and lodged in the Australian

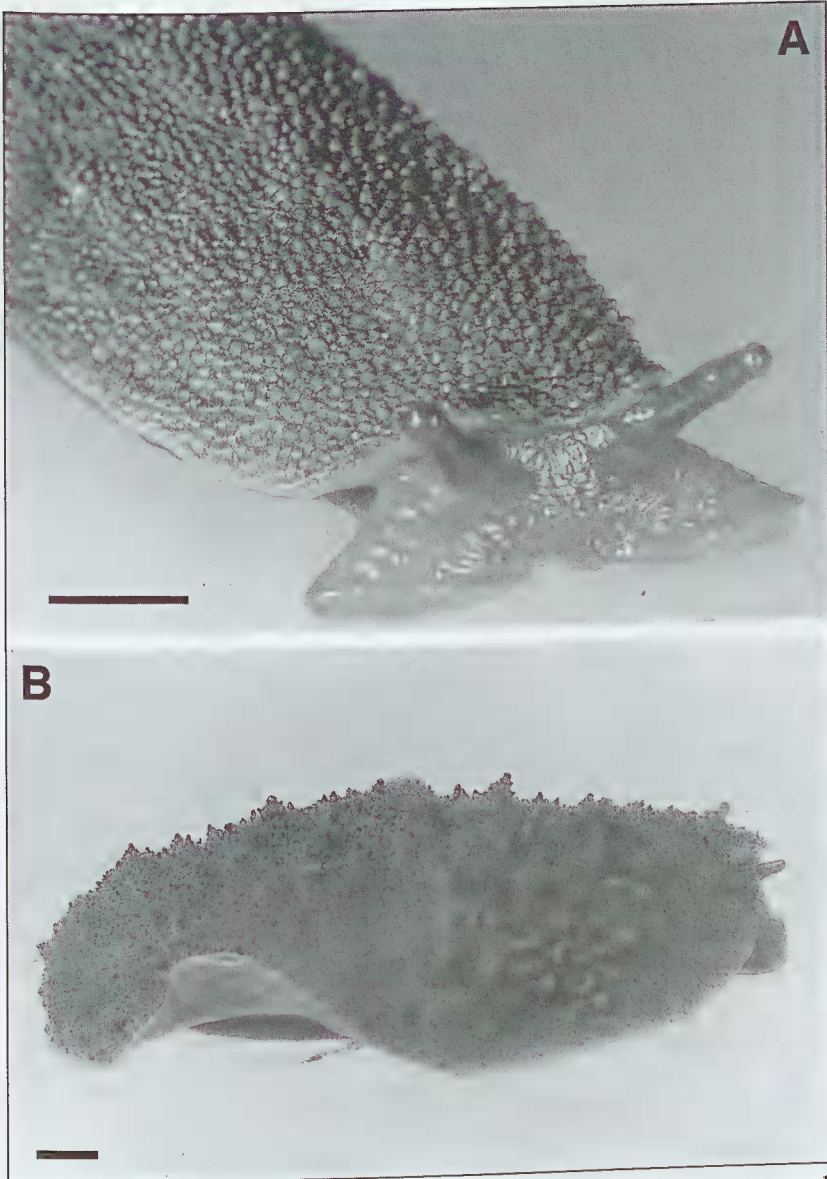


Figure 1.

A. *Onchidina australis*, dorsal view. B. *Onchidina australis*, ventral view. C. *Onchidium verruculatum*, dorsal view. D. *Onchidium verruculatum*, ventral view. Scale 10 mm.

Figure 2. (see opposite page)

A. *Onchidina australis*. B. *Onchidium verruculatum*, with some of the eye-bearing papillae visible. Scale 5 mm.



Museum, Sydney (*Onchidina australis*, C339585; *Onchidium verruculatum*, C339586). Representatives of one of the species (*Onchidina australis*) were found above high tide mark, living in burrows under rocks, while the other (*Onchidium verruculatum*) was below high tide mark, again under rocks but in wet mud and without burrows. Each individual was killed by placing it in a solution of magnesium chloride and gradually increasing the concentration. They were dissected while fresh (*i.e.* prior to preservation) and the digestive and reproductive systems examined and drawn. Key works on the family Onchidiidae were then referred to and used to classify the two species. Diagrams from the works of Marcus (1971), Marcus and Burch (1965), Marcus and Marcus (1956), Stantschinsky (1907) and Plate (1893) were used to identify internal structures.

Results

A comparison of the external appearance of each species revealed small differences in colour and shape (Table 1, Figures 1-3), and also differences in the position of the pneumostome (Figure 4) and the presence or absence of accessory eyes (Table 1, Figures 1A, 1D, 3). The slight displacement of the pneumostome to the right (seen in the supralittoral species) is characteristic of *Onchidina* Semper 1882; in the other three New South Wales genera the pneumostome is in the mid-line (Bretnall, 1919). The presence of dorsal eyes is characteristic of *Onchidium* Buchanan 1800.

The supralittoral species exhibited a form of colour changing. When the specimens were first collected, they were not all the same colour. However, after some time in captivity, individual slugs became more and more similar. This was not seen in the intertidal species.

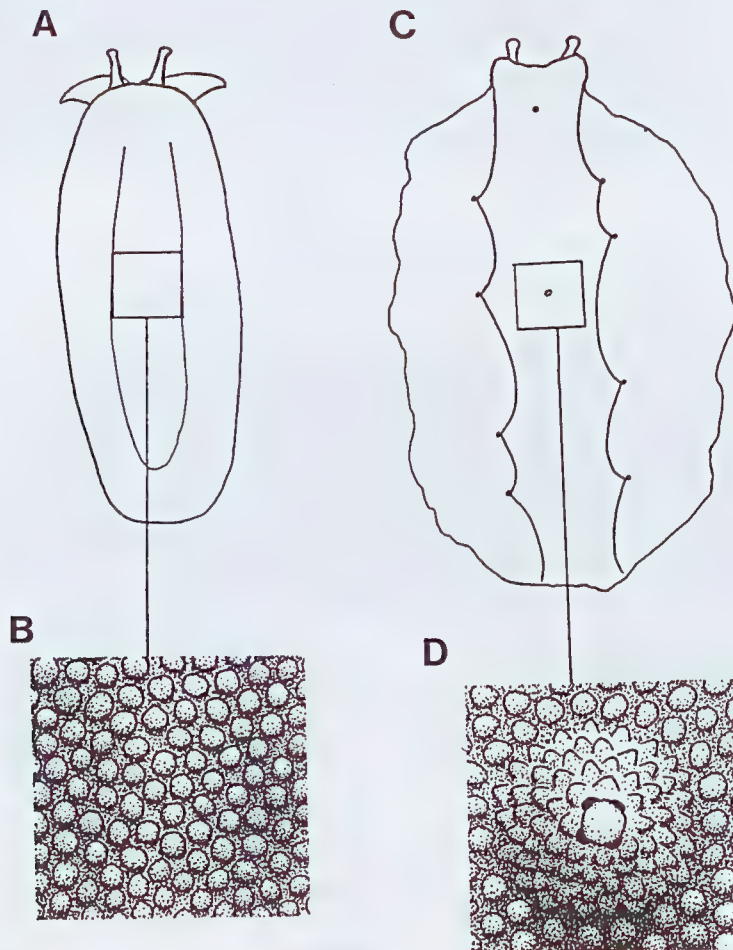


Figure 3.

Simplified dorsal view with a portion of the dorsum magnified to show the texture. A. *Onchidina australis*. B. Part of the dorsal surface of *Onchidina australis*. C. *Onchidium verruculatum*. Circles mark the positions of the accessory eyes. D. One of the dorsal papillae of *Onchidium verruculatum*, magnified to show the four accessory eyes.

Table 1

Comparison of the external features and the reproductive and alimentary systems of *Onchidina australis* and *Onchidium verruculatum*.

Characteristic	<i>Onchidina australis</i>	<i>Onchidium verruculatum</i>
External features		
Body shape	Body elongate, not very thick; firm and elastic to touch.	Body rounded, thick; soft to touch.
Dorsal surface	Contains small papillae that do not bear eyes; these are evenly spread and not restricted to the slightly raised section that runs down the middle of the dorsum (see Figures 1A, 3A).	Contains yellow-tipped papillae, each bearing three or four black eyes; these are found either at the edges of or within the raised portion of the dorsum (see Figures 1C, 3B). This middle area can be raised or lowered, particularly the eye-bearing papillae.
Dorsal colour	Olive-brown, with darker peripheral markings. The raised part is lighter and yellowish. There is some variation in colour; one specimen was much lighter.	Generally brown, but with variations including a uniform red-brown, or reddish markings.
Ventral colour	Head and foot yellow-brown; hyponotum highly reduced, dark grey-brown; mantle border with distinct yellow edge.	Foot and hyponotum blue-grey; mantle border gradually changing to yellow-brown.
Head	Head projecting freely from beneath the mantle; when fully protracted, both pairs of tentacles can be easily seen from above.	Head not projecting from the mantle border; eyestalks and sensory lappets barely visible, even when the slug is in motion.
Position of male reproductive opening	On the outside of the right eye-tentacle.	Towards the inside of the right eye-tentacle.
Pneumostome	Slightly to the right of the ventral midline (Figures 1B, 4A).	In the ventral midline (Figures 1D, 4B).
Internal features		
Salivary glands	Very large and filamentous.	Smaller, and leafy rather than filamentous.

Characteristic	<i>Onchidina australis</i>	<i>Onchidium verruculatum</i>
Stomach	Consisting of a very large crop (red in colour), a muscular gizzard and a digestive portion (Figure 7A).	Crop absent; gizzard and digestive portion present.
Intestine	Coiled in three loops (Figure 7A).	Coiled in two loops (Figure 7B).
Lungs	Occupying about one fifth of the body.	Occupying about one third of the body.
Reproductive system		
Ovotestis	Multiple, each kidney-shaped; vivid orange-brown.	Single, large, spherical; vivid orange-brown.
Hermaphrodite duct	One exits each ovotestis, then they merge. Each is highly coiled and white.	A single highly coiled duct; white.
Female system (Figure 5)		
Seminal receptacle	Small, granular, yellow.	Small, smooth, yellow.
Albumen glands	Paired; highly lobate but relatively small; yellow.	Paired; highly lobate and quite large; pink.
Spiral glands	Fine tubes, not tightly coiled; yellow.	Thick tubes, tightly coiled; white.
Spermatheca	Small and very firm, with a thick, coiled duct; white.	Large and very squalid, with a short duct; silvery-grey.
Male system (Figure 6)		
Vas deferens	About three times the length of the body; entering the body wall just above the spermatheca then emerging near the right eyestalk, before coiling first around itself and then around the penis.	About twice the length of the body; running through the body wall and entwining around itself and the penis.
Penis	Very long (almost the length of the body).	Short, about one fifteenth the length of the body.
Penial gland	Absent.	Very large. Attached to it is a highly coiled, very long tube, with an enlarged portion in the middle (Figure 6B).
Penis retractor muscle	Short.	Long.

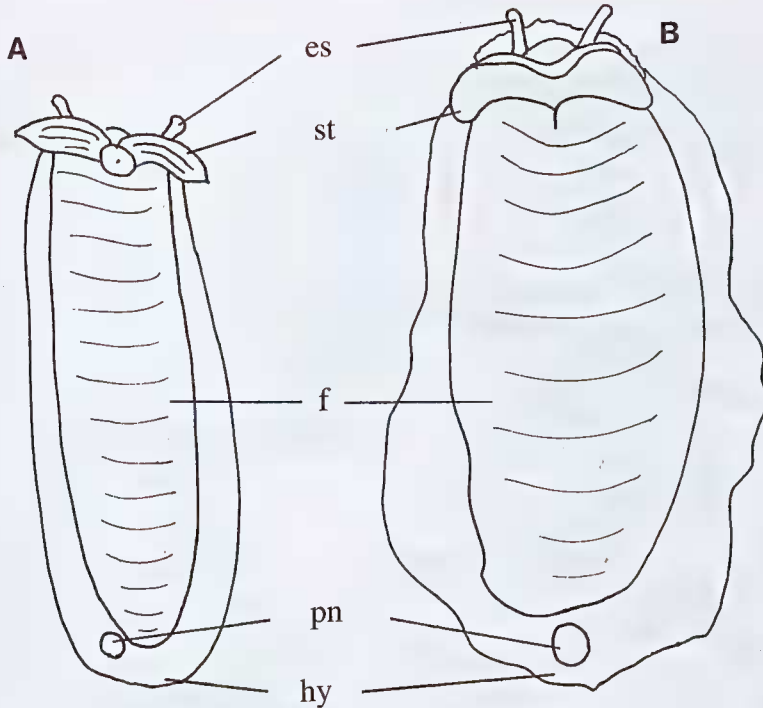


Figure 4. Simplified ventral view showing the position of the pneumostome. A. *Onchidina australis*. B. *Onchidium verruculatum*. es - eyestalks, f - foot, hy - hyponotum, pn - pneumostome, st - sensory tentacles.

There were considerable differences between the reproductive systems of the two species (Table 1, Figure 5), especially the male structures (Table 1, Figure 6). The alimentary systems also contained some distinctive features (Table 1, Figure 7), especially in the coiling of the intestine.

Diagrams of the penis and vas deferens from Plate (1893) were used for final confirmation of the identification of the supralittoral species as *Onchidina australis* Semper 1882 and the intertidal species as *Onchidium verruculatum* Cuvier 1830. Both of these species were recorded from around Sydney by Dakin (1947).

Discussion

Onchidina australis and *Onchidium verruculatum* are similar in external appearance and can only be distinguished in the field by the position of the pneumostome and the presence or absence of accessory eyes. Both of these features have been previously noted (Bretnall, 1919). This study has also revealed slight but distinctive differences in the colour and shape of live specimens: *Onchidina australis* is elongate, and *Onchidium verruculatum* more rounded with a wider hyponotum. Previous notes on these features were often based on preserved specimens and are therefore not very reliable. However, Britton (1984) and Bretnall (1919) both state that *Onchidina* is very elongate with a reduced hyponotum while *Onchidium* is variable (oval to elongate oval).

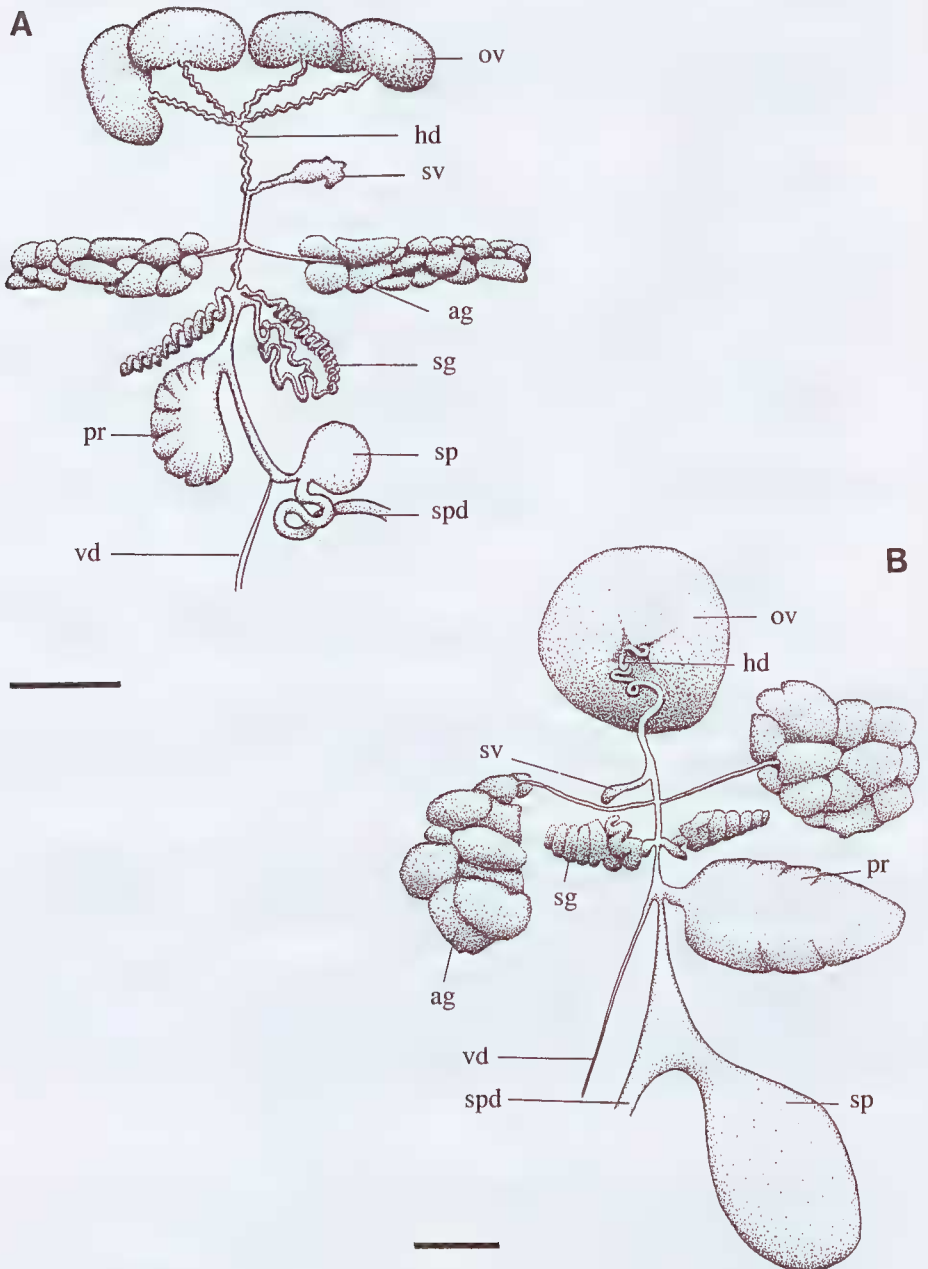


Figure 5.

Reproductive system. **A.** *Onchidina australis*. **B.** *Onchidium verruculatum*. **ag** - albumen gland, **hd** - hermaphrodite gland, **ov** - ovotestis, **pr** - prostate, **sg** - spiral gland, **sp** - spermatheca, **spd** - spermathecal duct, **sv** - seminal vesicle, **vd** - vas deferens. Scale 10 mm.

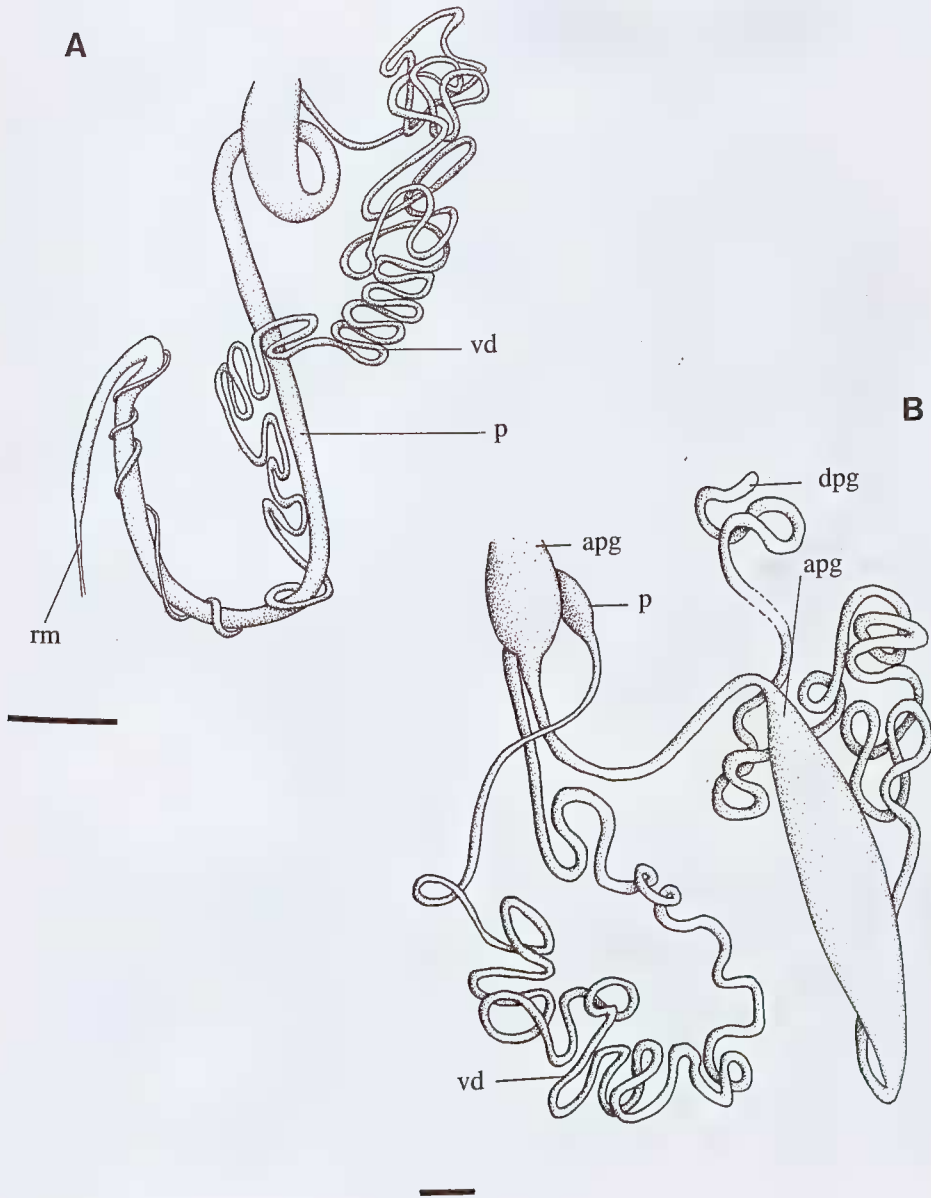


Figure 6. Male portion of the reproductive system. **A.** *Onchidina australis*. **B.** *Onchidium verruculatum*. **apg** - accessory penial gland, **dpg** - duct of penial gland, **p** - penis, **rm** - retractor muscle, **vd** - vas deferens. Scale 5 mm.

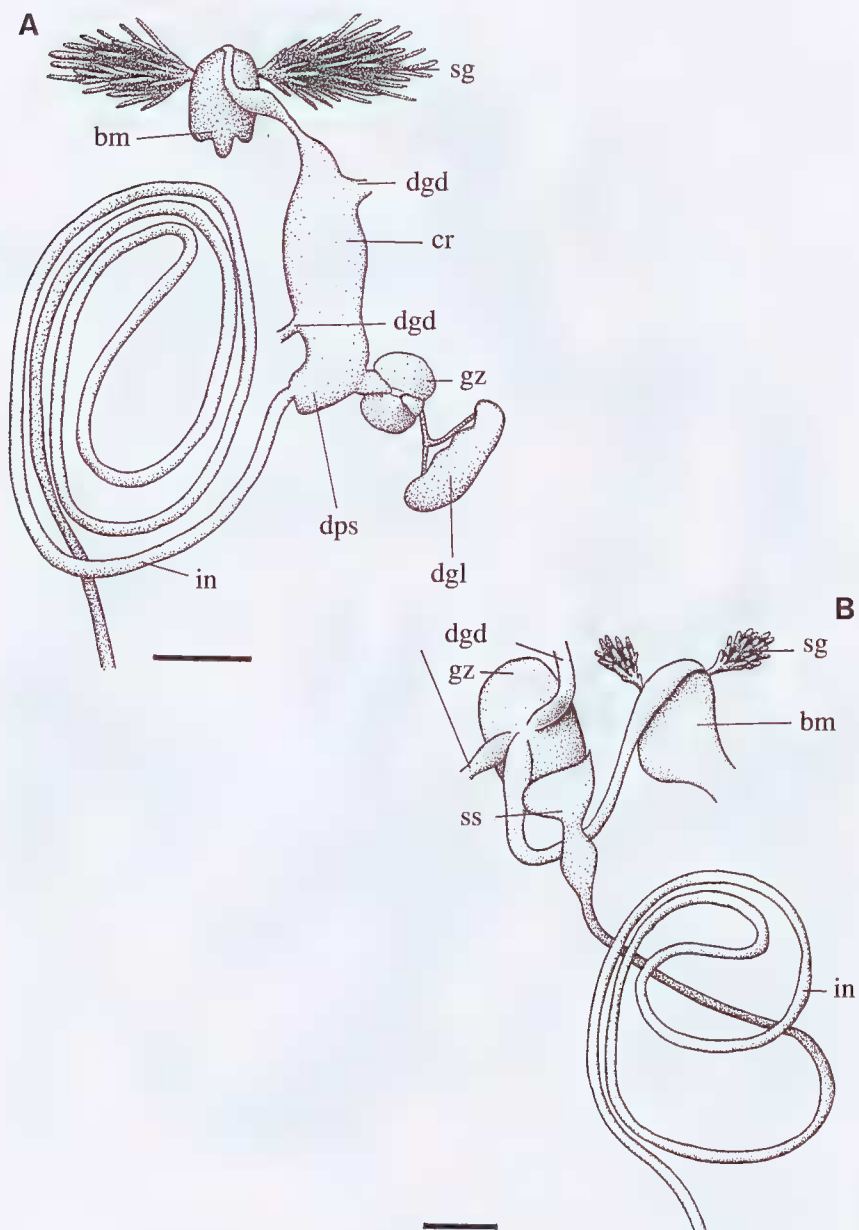


Figure 7.

Alimentary system **A.** *Onchidina australis*. **B.** *Onchidium verruculatum*. **bm** - buccal mass, **cr** - crop, **dgd** - digestive gland duct, **dgl** - lobe of digestive gland, **dps** - digestive portion of stomach, **gz** - gizzard, **in** - intestine, **sg** - salivary gland, **ss** - secondary stomach. Scale 10 mm.

The observed change in the body colour in *Onchidina australis* may be analogous to the colour changing properties of *Platevindex chameleon* and *Onchidium damelii*, which are mentioned by Bretnall (1919). This property has apparently not been observed in other species.

The male reproductive organs are commonly used to distinguish among members of the Onchidiidae, and were used by both Plate (1893) and Bretnall (1919) as the basis for their keys. Such features as the length of the penis and presence or absence of the accessory penial gland readily distinguish the two species in this study. There are also other useful characters, hitherto unmentioned, such as the number of lobes of the ovotestis (multiple lobes in *Onchidina australis*; only one in *Onchidium verruculatum*). The alimentary system also contains useful features. Labbé (1934) identified five gut types and proposed that these could be used to differentiate the different genera. It has since been argued that this is not the case, and different gut coilings are reported within one species (Britton, 1984). However, in general Labbé's type I is seen in *Onchidium* and type II in *Onchidina* (Britton, 1984), and this observation was supported by this study. In the two species examined here the gut type was found to be consistent within each species.

This study demonstrates that substantial differences exist between *Onchidina australis* and *Onchidium verruculatum*, even though they are similar externally. However, there are three other onchidiids found around Sydney, and in some areas more than two species can be found. In some parts of Southeast Asia up to twenty sympatric species can be found in mangroves (Britton, 1984), and many of these are poorly known. Considerable work remains to be done in identifying and describing these species, as no modern systematic treatments are available for this interesting group.

Conclusion

Onchidium verruculatum and *Onchidina australis* are not only very similar in external appearance but are also found in similar habitats. Important features such as the position of the pneumostome can be used to distinguish between the two species in the field, and there are also other internal characteristics such as aspects of the reproductive system that are diagnostic at the generic level. However, both species exhibited considerable variation in shape and colour, and given the substantial external similarity, they can easily be confused unless closely examined. Up to five species have been recorded in the Sydney area (Dakin, 1947), and it is apparent that a careful study of both internal and external characteristics from many more populations will be required to make a full assessment of the onchidiid fauna of even this small part of eastern Australia.

Acknowledgments

I would like to thank Dr Winston Ponder of the Australian Museum for his supervision of this project, help with revisions of the manuscript and for his encouragement and enthusiasm. I would also like to thank Malcolm Ricketts, who provided the photographs and helped with preparation of the plates, and two anonymous reviewers for their constructive comments.

References

- Bretnall, R. W. 1919. Onchidiidae from Australia and the South-Western Pacific Islands. *Records of the Australian Museum* **12**: 303-328.
- Britton, K. M. 1984. The Onchidiacea (Gastropoda, Pulmonata) of Hong Kong with a worldwide view of the genera. *Journal of Molluscan Studies* **50**: 179-191.
- Dakin, W. J. 1947. The true sea-slug - *Onchidium*. *Australian Museum Magazine* **30-4-1947**: 141-147.
- Labbé, A. 1934. Sur une forme nouvelle de Silicoderme, *Elophilus ajuthiae* nov. gen. nov. sp. *Bulletin de la Société Zoologique de France, Paris* **60**: 312-317.
- Marcus, E. 1971. On some Euthyneuran Gastropods from the Indian and Pacific Oceans. *Proceedings of the Malacological Society of London* **39**: 355-369.
- Marcus, E. & Burch, J. B. 1965. Marine Euthyneuran Gastropods from Eniwetok atoll, Western Pacific. *Malacologia* **3(2)**: 235-262.
- Marcus, E. & Marcus, E. 1956. Zwei Atlantische Onchidellen. *Kieler Meeresforschungen* **12(1)**: 76-84.
- Plate, L. H. 1893. Studien über Opisthopneumone Lungenschnecken, II. *Zoologische Jahrbücher Abteilung für Anatomie und Ontogenie der Tiere* **7**: 93-234.
- Smith, B. J. & Kershaw, R. C. 1979. *Field guide to the non-marine molluscs of South Eastern Australia*. ANU Press, Canberra.
- Stanisic, J. 1998. Superfamily Onchidioidea. Pp. 1063-1064 in Beesley, P. L., Ross, G. J. B. and Wells, A. (eds) *Mollusca: the southern synthesis. Fauna of Australia Vol. 5*. CSIRO Publishing: Melbourne, Part B viii pp 565-1234.
- Stantschinsky, W. 1907. Zur Anatomie und Systematik der Gattung *Oncidium*. *Zoologische Jahrbücher Abteilung für Systematische Ökologie und Geographie der Tiere* **25**: 353-402.